

5 improvement comprising:

touching the indicia;

10 keypad display on a region of the touch screen;

touching a first region of the keypad to signal

displaying on the touch screen a button

touching the button soliciting verification; and

wherein erroneous changes of treatment parameters  
nized.

30 3. The method of claim 1 which further includes:  
establishing upper and lower limits for the  
parameter; and

35 limits being displayed at the location on the screen where the indicia corresponding to said parameter was displayed prior to the touching of said indicia.

providing a touch screen interface;

5 displaying on the touch screen first and second axes, the first axis corresponding to the time varying parameter, the second axis corresponding to time;

touching the touch screen at a plurality of points to define points on a parameter versus time curve;

10 presenting on the touch screen a series of bars  
corresponding to said curve;

selecting one of said bars for alteration;

displaying a numeric parameter corresponding to the selected bar on the screen;

15 touching the screen at first or second locations to increase or decrease, respectively, the displayed numeric parameter and thereby alter the value of the parameter to which the selected bar corresponds;

touching the screen at a third location to  
20 signify completion of the programming; and  
storing data corresponding to the bars in a  
memory to which the process control system can refer in  
changing the parameter with time.

25            5. The method of claim 4 which further includes:  
presenting on the screen a first series of bars  
corresponding to historical values of the parameter, said  
first series of bars being displayed with a first visually  
perceptible character;

30 displaying on the screen a second series of bars corresponding to upcoming programmed values of the parameter, said second series of bars being displayed with a second visually perceptible character different than the first; and

35        permitting only bars of the second series to be  
selected for alteration.

[illegible]

6. The method of claim 5 in which the process control system is a dialysis machine.

7. The method of claim 6 in which the time  
5 varying parameter is ultrafiltration, and in which the  
method further includes displaying on the screen a numeric  
parameter corresponding to an area under the parameter  
versus time curve, said area representing the total  
ultrafiltrate programmed to be removed from a patient.

8. A method of operating a dialysis machine to establish desired treatment parameters, the method comprising the steps:

15 providing first and second data card interface devices, the first device being associated with a computer, the second device being associated with the dialysis machine;

operating the computer in conjunction with the first data card interface device to load into a data card a set of desired treatment parameters, said set including parameters relating to three or more of the following:

ultrafiltration profile;

sodium profile;

bicarbonate profile;

blood pump flow rate;

treatment time;

~~dialysate~~ flow rate;

~~dialysate temperature;~~

~~blood pressure measurement schedule;~~

~~blood~~ pressure alarm limits; and

heparin prescription

operating the dialysis machine in conjunction with the second data card interface device to read from said data card said treatment parameters; and

for each of said parameters:

displaying on a display device associated with the dialysis machine said parameter;

querying, via the display device, whether the displayed parameter is correct and soliciting operator verification of same; and

5 establishing the displayed parameter as a treatment parameter only if the operator verifies said parameter.

9. A kidney dialysis machine comprising:

10 a dialyzer with a dialysate compartment, a blood compartment separated from the dialysate compartment by a dialysis membrane, a dialysate input, a dialysate output, a blood input, and a blood output;

15 means for preparing dialysate and means for circulating the dialysate through a dialysate circuit, the dialysate circuit including the dialysate compartment, the dialysate input and the dialysate output of the dialyzer;

20 means for effecting extracorporeal circulation of blood from a dialysis patient through a blood circuit, the blood circuit including the blood compartment, the blood input, and the blood output of the dialyzer; and

means for effecting a preselected net passage of liquid from the blood compartment through the dialysis membrane to the dialysate compartment.

25 10. A kidney dialysis machine as recited in claim 9 further comprising:

a bypass valve in the dialysate circuit for automatically shunting dialysate flow away from the dialysate compartment; and

30 a flow sensor in the dialysate circuit for sensing that no dialysate is flowing to the dialysate compartment from the kidney dialysis machine whenever the bypass valve is shunting dialysate flow away from the dialysate compartment.

35 11. A kidney dialysis machine as recited in claim 9 further comprising:

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a valve in the dialysate circuit adapted to automatically shunt dialysate away from the dialysate compartment; and

5 a flow sensor in the dialysate circuit for sensing that no net passage of liquid from the blood compartment to the dialysate compartment or from the dialysate compartment to the blood compartment occurs whenever said valve is shunting dialysate away from the dialysate compartment.

12. A kidney dialysis machine as recited in claim 9 wherein said means for effecting a preselected net passage of liquid from the blood compartment through the dialysis membrane to the dialysate compartment comprises means for delivering a first volume of dialysate to the dialysate compartment of the dialyzer, means for simultaneously removing a second volume of dialysate equal to the first volume from the dialysate compartment of the dialyzer, and an ultrafiltration flow meter situated in the dialysate circuit between said means for delivering the first volume and said means for delivering the second volume, the ultrafiltration flow meter operable to remove a preselected volume of liquid from the dialysate circuit between said means for delivering the first volume of dialysate and said means for removing a second volume of dialysate.

13. A kidney dialysis machine as recited in  
claim 12 including;  
30 means for creating a volumetrically closed  
hydraulic loop in the dialysate circuit between said means  
for delivering the first volume and means for removing the  
second volume; and  
pressure-monitoring means for monitoring  
35 hydraulic pressure in the closed loop against pressure  
alarm limits.

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20 21. A kidney dialysis machine as recited in  
claim 20 further comprising first pressure equalizing  
means coupled to the inlet of the flow equalizer for  
equilibrating hydraulic pressures at the inlets of the  
"pre-dialyzer" and "post-dialyzer" compartments and second  
25 pressure equalizing means coupled to the outlet of the  
flow equalizer for equilibrating hydraulic pressures at  
the outlets of the "pre-dialyzer" and "post-dialyzer"  
compartments.

35 23. A kidney dialysis machine as recited in claim 9 further comprising means for automatically turning on preselected machine functions after a preselected duration of a power-off condition.



25. A kidney dialysis machine as recited in claim 9 adapted to effect extracorporeal circulation of blood using a blood-line set having at least one drip chamber for containing a volume of blood up to a preselected level in the chamber, the machine further comprising a drip-chamber level adjuster including an automatically actuated valve having a first end coupled to the drip chamber and a second end coupled to a reversible positive-displacement pump, the pump and valve controllably actuatable to permit a machine operator to selectively raise and lower the level in the chamber.

30 27. A kidney dialysis machine as recited in claim 9 further comprising:  
means for circulating dialysate through the dialysate circuit at a preselected flow rate;  
a blood-leak detector in the dialysate circuit  
35 located downstream of the dialysate compartment, the blood-leak detector including an LED for generating light for passing through the dialysate passing through the blood-leak detector, and a photodetector for receiving

